

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-9, 18, 23, 54, and 63-85 are pending in the application. Claims 1 and 54 are independent claims. Claims 10-17, 19-22, 24-53, and 55-62 are sought to be cancelled without prejudice to or disclaimer of the subject matter therein. Claims 1 and 54 are sought to be amended. New claims 63-85 are sought to be added. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Rejection under 35 U.S.C. § 102

Claims 1 and 18

On page 2 of the Office Action, the Examiner rejected claims 1 and 18 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 4,849,668 to Crawley *et al.* (hereinafter Crawley), U.S. Patent No. 5,424,596 to Mendenhall *et al.* (hereinafter Mendenhall), or U.S. Patent No. 5,389,849 to Asano *et al.* (hereinafter Asano). Applicants respectfully traverse.

As described in the specification of the present application, in an embodiment a biometric sensing apparatus according to the invention comprises a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array. (See, e.g., FIG. 8 of the present application.) Each of these elements has an impedance that varies according to an applied load. Because the impedance of each of the piezoelectric ceramic elements varies with applied load, the sensor is capable of detecting features of a finger such as fingerprint ridges and fingerprint valleys. (See, e.g., FIG. 17 of the present application.)

In an embodiment, the sensor operates in an impedance mode. (See, e.g., pages 21-23 of the present application.) When operating in the impedance mode, an AC voltage is

coupled across the piezoelectric ceramic elements using a multiplexer, and the currents passing through the piezoelectric ceramic elements are determined. Using a processor coupled to the sensor, the impedances of the piezoelectric ceramic elements are determined from the currents passing through the piezoelectric ceramic elements. As described in the present application, using the invention it is possible to determine which of the piezoelectric ceramic elements are loaded by a fingerprint ridge and which of the piezoelectric ceramic elements are loaded by a fingerprint valley. When operating in the impedance mode, the elements of the piezoelectric ceramic sensor are not required to generate and receive ultrasonic waves.

Accordingly, claim as amended recites:

1. (ONCE AMENDED) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, each of said elements having an impedance that varies according to an applied load, said sensor operating in an impedance mode and detecting features of a finger proximate to said sensor; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.

The combination of features recited in claim 1, as amended, are not anticipated by Crawley, Mendenhall, or Asano. Crawley, for example, appears to be directed to the construction of a laminated composite structural member having embedded piezoelectric elements therein for controlling mechanical properties of the completed structure. The structure of Crawley, however, is not a sensing apparatus having the features recited in claim 1. Similarly, neither the structure of Mendenhall nor the structure of Asano is a sensing apparatus having the features recited in claim 1. Thus, reconsideration and withdrawal of the rejection of claim 1 are respectfully requested.

Claim 18 depends from claim 1 and is patentable over Crawley, Mendenhall, or Asano for at least the same reasons that claim 1 is patentable over Crawley, Mendenhall,

or Asano. Reconsideration and withdrawal of the rejection of claim 18 are respectfully requested.

Claim 23

On page 2 of the Office Action, the Examiner rejected claim 23 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 5,578,761 to Clark, Jr. *et al.* (hereinafter Clark), U.S. Patent No. 4,499,394 to Koal (hereinafter Koal), or U.S. Patent No. 4,643,028 to Kondo *et al.* (hereinafter Kondo). Claim 23 depends from claim 1 and adds the further feature of "a multiplexer that couples said sensor to said processor." Applicants respectfully traverse.

The combination of features recited in claim 1, as amended, are not anticipated by Clark, Koal, or Kondo. Clark appears to be directed to an adaptive sensoriactuator. Koal appears to be directed to an animal foot-pressure sensor. Kondo appears to be directed to a ultrasonic equipment. Neither Clark, Koal, nor Kondo anticipate a sensing apparatus having the features recited in claim 1 or a sensing apparatus having the features recited in claim 23. Thus, reconsideration and withdrawal of the rejection of claim 23 are respectfully requested.

Claim 54

On page 2 of the Office Action, the Examiner rejected claim 54 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 5,760,530 to Kolesar (hereinafter Kolesar), U.S. Patent No. 4,634,917 to Dvorsky *et al.* (hereinafter Dvorsky), or U.S. Patent No. 5,500,635 to Mott (hereinafter Mott). Applicants respectfully traverse.

As amended, claim 54 recites:

54. (ONCE AMENDED) A biometric sensing apparatus, comprising:

a piezoelectric sensor responsive to features of a finger proximate to said sensor, said sensor operating in an impedance mode to produce impedance data; and

a processor, coupled to said sensor, that comprises an impedance detector that processes impedance data received from said sensor and produces an output representative of features of the finger.

Both Kolesar and Dvorsky appear to be directed to a piezoelectric tactile sensor device. Neither Kolesar nor Dvorsky anticipate a biometric sensing apparatus having the combination of features recited in claim 54. For example, neither the piezoelectric tactile sensor device of Kolesar nor the piezoelectric tactile sensor device of Dvorsky have "a processor, coupled to said sensor, that comprises an impedance detector that processes impedance data received from said sensor and produces an output representative of features of the finger." Thus for at least this reason, claim 54 is patentable over Kolesar or Dvorsky.

Mott appears to be directed to products, such as a shoe, that incorporate piezoelectric material. Mott does not describe a biometric sensing apparatus having the combination of features recited in claim 54. Thus, claim 54 is not anticipated by Mott.

For at least the reasons noted above, claim 54 is not anticipated Kolesar, Dvorsky, or Mott. Reconsideration and withdrawal of the rejection of claim 54 are respectfully requested.

Claims 2 and 3

On page 2 of the Office Action, the Examiner rejected claims 2 and 3 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 5,673,041 to Chatigny *et al.* (hereinafter Chatigny), U.S. Patent No. 4,394,773 to Ruell (hereinafter Ruell), or Asano. Applicants respectfully traverse.

Claims 2 and 3 depend from claim 1. As noted above, claim 1 recites features of:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, each of said elements having an impedance that varies according to an applied load, said sensor operating in an impedance mode and detecting features of a finger proximate to said sensor; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.

Chatigny appears to be directed to a reflective mode ultrasonic touch sensitive switch. Chatigny does not anticipate the combination of features recited in claim 1. For example, Chatigny does not anticipate a "sensor operating in an impedance mode." As already noted herein, in impedance mode a biometric sensing apparatus according to the invention does not operate by generating and receiving reflected ultrasonic waves. Since Chatigny does not anticipate the combination of features recited in claim 1, and claims 2 and 3 depend from claim 1, Chatigny does not anticipate the combination of features recited in claims 2 and 3.

Ruell appears to be directed to a fingerprint sensor that operates by detecting and measuring a static charge (i.e., charge distribution) with a charged coupled device (see, e.g., column 4, lines 5-15 and FIG. 3 of Ruell). Ruell does not anticipate the combination of features recited in claim 1. For example, Ruell does not anticipate a "sensor operating in an impedance mode." Detecting and measuring a static charge with a charged coupled device is very different than producing, measuring, and processing a current to produce an output representative of features of a finger (impedance mode operation). Nowhere does Ruell describe producing, measuring, or processing a current. Since Ruell does not anticipate the combination of features recited in claim 1, and claims 2 and 3 depend from claim 1, Ruell does not anticipate the combination of features recited in claims 2 and 3.

For at least the reasons stated herein with respect to claim 1, claim 1 is patentable over Asano. Since Asano does not anticipate the combination of features recited in claim 1, and claims 2 and 3 depend from claim 1, Asano does not anticipate the combination of features recited in claims 2 and 3.

For at least the above reasons, claims 2 and 3 are patentable over Chatigny, Ruell, or Asano. Reconsideration and withdrawal of the rejection of claims 2 and 3 are respectfully requested.

Claims 4-9

On page 2 of the Office Action, the Examiner rejected claims 4-9 under 35 U.S.C. § 102(a) as being unpatentable over U.S. Patent No. 5,273,045 to Chihara *et al.* (hereinafter Chihara). Applicants respectfully traverse.

Claims 4-9 depend from claim 1. As noted above, claim 1 recites features of:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, each of said elements having an impedance that varies according to an applied load, said sensor operating in an impedance mode and detecting features of a finger proximate to said sensor; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.

Chihara appears to be directed to ultrasonic equipment and a catheter-type ultrasonic probe. Chihara does not anticipate a "sensor operating in an impedance mode." In impedance mode, a biometric sensing apparatus according to the invention does not operate by generating ultrasonic waves. Since Chihara does not anticipate the combination of features recited in claim 1, and claims 4-9 depend from claim 1, Chihara does not anticipate the combination of features recited in claims 4-9.

Rejections under 35 U.S.C. § 103

On page 2 of the Office Action, the Examiner rejected claims 4-9 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,971,927 to Mine (hereinafter Mine) or U.S. Patent No. 5,623,930 to Wright *et al.* (hereinafter Wright) in view of U.S. Patent No. 5,421,335 to Wild (hereinafter Wild) or U.S. Patent No. 5,311,095 to Smith *et al.* (hereinafter Smith). Applicants respectfully traverse this rejection.

As noted above, claims 4-9 depend from claim 1, and claim 1 recites features of:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, each of said elements having an impedance that varies according to an applied load, said sensor operating in an impedance mode and detecting features of a finger proximate to said sensor; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.

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Mine and Wright both appear to be directed to ultrasonic equipment that generate ultrasonic waves. Thus, neither Mine nor Wright describe or make obvious, for example, a "sensor operating in an impedance mode." In impedance mode, a biometric sensing apparatus according to the invention does not operate by generating ultrasonic waves. Since neither Mine nor Wright describe or make obvious the combination of features recited in claim 1, and claims 4-9 depend from claim 1, neither Mine nor Wright describe or make obvious the combination of features recited in claims 4-9.

Neither Wild nor Smith overcome the deficiencies of Mine and Wright. Wild and Smith also both appear to be directed to ultrasonic equipment that generate ultrasonic waves. Thus, claims 4-9 are patentable of Mine, Wright, Wild, and Smith, alone or in combination. Reconsideration and withdrawal of this rejection of claims 4-9 are respectfully requested.

New Claim 63-72 and 85

New claims 63-72 and 85 are added to further define the invention recited in independent claim 54. Claims 63-72 and 85 depend, either directly or indirectly, from independent claim 54. Since independent claim 54 is patentable over the references applied by the examiner, for at least the reasons described herein, claims 63-72 and 85 are also patentable over the applied references. Consideration and allowance of new claims 63-72 and 85 are respectfully requested.

New Claim 73-84

New claims 73-84 are added to further define the invention recited in independent claim 1. Claims 73-84 depend, either directly or indirectly, from independent claim 1. Since independent claim 1 is patentable over the references applied by the examiner, for at least the reasons described herein, claims 73-84 are also patentable over the applied references. Consideration and allowance of new claims 73-84 are respectfully requested.

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Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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Version with markings to show changes made

In the Claims

Please cancel claims 10-17, 19-22, 24-53, and 55-62 without prejudice to or disclaimer of the subject matter therein.

Please substitute the following claim 1 for the pending claim 1:

1. (ONCE AMENDED) A biometric sensing apparatus, comprising:
a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, each of said elements having an impedance that varies according to an applied load, said sensor operating in an impedance mode and detecting features of a finger proximate to said sensor; and
a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output.

Please substitute the following claim 54 for the pending claim 54:

54. (ONCE AMENDED) A biometric sensing apparatus, comprising:
a piezoelectric [film] sensor responsive to features of a finger proximate to said sensor, said sensor operating in an impedance mode to produce impedance data; and
a processor, coupled to said sensor, [that receives an input from said sensor and produces an output] that comprises an impedance detector that processes impedance data received from said sensor and produces an output representative of features of the finger.

Please add new claims 63-85.